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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/552,438	10/06/2005	Koichi Kanaya	125451	8904
25944 7590 04/24/2007 OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320			EXAMINER CHEN, KEATH T	
			ART UNIT	PAPER NUMBER
			1709	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		04/24/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/552,438

Applicant(s)

KANAYA ET AL.

Examiner

Keath T. Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 March 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 6-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 6-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 October 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>03/2006</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Preliminary amendment as of 10/6/2005 by applicant is received. Claims 1-5 have been cancelled and claims 6-21 have been added and are pending.

#### ***Drawings***

The drawings are objected to because Fig. 4 is not labeled as "prior art". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 8 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

“the substrate supporting surface is inclined with respect to the horizontal surface at an angle” is understood as defined in claim 6 (emphasize an). One interpretation of this claim includes that the side view of substrate supporting surface (#20a in Fig. 3 of the application) being a straight line (as oppose to a curve) and will be examined in this context henceforth.

“an angle which is made by the horizontal surface and ‘a tangent to the semiconductor substrate’ at a contact of ‘the substrate supporting surface and the semiconductor substrate’” is not clear. In a particularly view, “a tangent” for a substrate with curved ends (W as shown in Fig. 4 of application) will have a tangent line the same as the line discussed in the last paragraph (#20a in Fig. 3 of the application). This is one of the interpretations of claims 8 and 9, and will be examined in this context henceforth.

On the other hand, a substrate with flat ends or square edge (W as shown in Fig. 2A) will have no tangent line at the contact of the substrate supporting surface and this claim limitation is unclear because it appears to make patentability dependent on the use of the apparatus rather than the structural features of the apparatus.

The part “in an imaginary plane including a(n) central axis of the pocket” is not clear as whether it refers to the angles, the contact point, the substrate supporting surface, or the substrate in such a plane. This part does not add any specific limitation to the claim and will be examined in this context henceforth.

Claims 12, 13, 16, 17, 20, and 21 are rejected under 35 U.S.C. 112 as dependent claims on claims 8 or 9.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 6, 8, 10, 12, 14, 16, 18, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Moore (US 5820686, hereafter '686).

'686 teaches all the limitations of claim 6:

A susceptor (Fig. 23D) in which a semiconductor substrate (#2304) is supported approximately horizontally in a pocket (center hole between #2304 and #2330 in Fig. 23D, not labeled in Fig. 23D, corresponding to #403, Figs. 4B-G,) when performing a vapor phase growth of a single crystal thin film on a front surface of the semiconductor substrate, and in which the pocket comprises an outer peripheral pocket portion (#2391a) to support the semiconductor substrate and a central side pocket portion (#2330) which is formed inside the outer peripheral side pocket portion to be concave from the outer peripheral side pocket portion (col. 24, lines 62-64, centrally formed hole is concave from #2391 including #2391a), wherein the outer peripheral side pocket

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portion comprises a substrate supporting surface which is inclined with respect to a horizontal surface to be lowered toward a central side from an outer peripheral side of the pocket (col. 24, lines 54-61), and a region of the substrate supporting surface excluding at least an inner peripheral edge supports a portion of a rear surface of the semiconductor substrate which is inside an outer peripheral edge of the semiconductor substrate (col. 24, lines 42-45 and 49-52). (The support surface contacts the outer edge but not the inner surface of the wafer).

'686 further meets the limitations of claim 8:

"The substrate supporting surface is inclined with respect to the horizontal surface at an angle equal to an angle which is made by the horizontal surface and a tangent to the semiconductor substrate at a contact of the substrate supporting surface and the semiconductor substrate".

The substrate supporting surface (Fig. 23D, #2391a) is capable of holding a substrate with curved ends, the tangent line of which would form identical angle as the substrate supporting surface (relative to the horizontal line). "The material or article worked upon does not limit apparatus claims" (MPEP 2115).

'686 further teaches the limitations of claims 10 and 12:

The central side pocket portion is concave to have a depth so as not to contact a rear surface of the semiconductor substrate (col. 24, lines 49-52).

The examiner notices that col. 24, lines 49-52 in '686 means the contact remains between the edge of #2304c and #2391a, therefore, the rear surface of the

semiconductor substrate #2304 will not touch #2330. The depth of concave #2330 is indirectly specified by this description.

'686 further teaches the limitations of claims 14, 16, 18, and 20:

A vapor phase growth apparatus (col. 2, lines 7-11).

3. Claims 6, 8, 10, 12, 14, 16, 18, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Anderson et al. (US 2003/0178145, hereafter '145).

'145 teaches all the limitations of claim 6:

A susceptor (Fig. 5J, #540) in which a semiconductor substrate (#502) is supported approximately horizontally in a pocket (center portion in Fig. 5J, not labeled in Fig. 5J. labeled as #503 in Fig. 5E, [0035], lines 2-5) when performing a vapor phase growth of a single crystal thin film [0030] on a front surface of the semiconductor substrate, and in which the pocket comprises an outer peripheral pocket portion (Fig. 5J, #546) to support the semiconductor substrate and a central side pocket portion (center portion of #540 in Fig. 5J) which is formed inside the outer peripheral side pocket portion to be concave from the outer peripheral side pocket portion ([0035], lines 2-5, dished out center #503 is concave to the outer peripheral), wherein the outer peripheral side pocket portion comprises a substrate supporting surface which is inclined with respect to a horizontal surface to be lowered toward a central side from an outer peripheral side of the pocket (Fig. 5J, angle  $\beta$  inclined toward central side), and a region of the substrate supporting surface excluding at least an inner peripheral edge supports a portion of a rear surface (#548) of the semiconductor substrate which is

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inside an outer peripheral edge of the semiconductor substrate (Fig. 5J, contact #548 is inside the outer peripheral edge #513 of the substrate #502).

'145 further meets the limitations of claim 8:

"The substrate supporting surface is inclined with respect to the horizontal surface at an angle equal to an angle which is made by the horizontal surface and a tangent to the semiconductor substrate at a contact of the substrate supporting surface and the semiconductor substrate".

The substrate supporting surface (Fig. 5J, #546) is capable of holding a substrate with curved ends, the tangent line of which would form identical angle as the substrate supporting surface (relative to the horizontal line). "The material or article worked upon does not limit apparatus claims" (MPEP 2115).

'145 further teaches the limitations of claims 10 and 12:

The central side pocket portion (Fig. 5E, #503) is concave to have a depth so as not to contact a rear surface of the semiconductor substrate ([0002], lines 4-9).

Although '145 did not explicitly specify the depth of the dished out center #503, it is clearly anticipated that the contact is limited to the wafer edges, not at the center #503 ([0002], lines 4-9).

'145 further teaches the limitations of claims 14, 16, 18, and 20:

A vapor phase growth apparatus ([0030], CVD).



***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 7-9, 11-13, 15-17, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over '686, in view of Somekh et al. (US 5643366, hereafter '366).

'686 teaches all the limitations of claim 6, 10, 14, and 18 as discussed above.

Furthermore, '686 teaches the use of susceptor use in 300 mm diameter wafers (col. 8, lines 37-40). '686 shows an example of incline angle of about 4.1 degree for 200 mm substrate (col. 24, lines 57-61), but '686 also teaches that the particular dimensions the substrate surround ring are determined empirically to minimize slip and maintain substantially uniform temperature in substrate #2304 (col. 25, line 13-17).

'686 does not explicitly teach the limitation of claims 7, 11, 15, and 19:

(For a 300 mm substrate), the substrate supporting surface is inclined at an angle of more than 0 degree and not more than 1 degree with respect to the horizontal surface.

'366 is an analogous art to holding of semiconductor substrates in chemical vapor deposition apparatus (CVD). '366 teaches a means to transfer wafer (Fig. 4) with a slope (#60) at a slight angle, preferably 1 to 3 degrees (col. 5, lines 57-67).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have empirically explored various angle of substrate supporting surface for 300 mm substrates and '366 discloses that one to three degrees for holding wafers is a preferred angle. The motivation would have been from empirically to minimize slip and maintain substantially uniform temperature in 300 mm substrates as taught by '686, with a reasonable expectation of success that one degree angle would have provided the low slip and maintain uniform temperature of substrate.

'686 teaches all the limitations of claims 6, 10, 14, and 18 as discussed in the 102(b) rejections above. Furthermore, '686 and '366 together teaches all the limitations of claims 7, 11, 15, and 19, as discussed above in the 103(a) rejections above.

'686 does not explicitly teaches the use of substrate with curved ends, it does not explicitly meet the limitation of claims 8, 12, 16, 20, 9, 13, 17 and 21. Because '686 teaches the use of substrate with straight angle at end (Fig. 23D) which makes the limitation indefinite, as discussed in the 112 rejection section.

'366 teaches the use of substrates with curved ends (Fig. 4). The tangent line at the contact edge (#41 in Fig. 4) is defined by #58, #59 of the same figure. Therefore,

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"the angle defined by the substrate supporting surface with respect to the horizontal surface equal to an angle which is made by the horizontal surface and a tangent to the semiconductor substrate at a contact of the substrate supporting surface and the semiconductor substrate" is met.

'366 and '686 are in the analogous arts of substrate processing. At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined the teaching in '366 by using a substrate with curved ends in the substrate processing environment provided in Fig. 23D of '686. The motivation would have been to achieve maximum wafer throughput while depositing uniform film layers (col. 1, lines 39-41); to support sufficient stability and rigidity to support either a single large wafer or multiple wafers (col. 3, lines 43-47); and to provide low slip and maintain uniform temperature as taught by '686 (col. 25, lines 13-17); more specifically, the configuration given in Fig. 23D of '686 provides a uniform temperature of substrate (cols. 24, lines 53-54).

5. Claims 7, 9, 11, 13, 15, 17, 19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over '686, in view of '145.

'686 teaches all the limitations of claim 6, 10, 14, and 18 as discussed above. Furthermore, '686 teaches the use of susceptor use in 300 mm diameter wafers (col. 8, lines 37-40). '686 shows an example of incline angle of about 4.1 degree for 200 mm substrate (col. 24, lines 57-61), but '686 also teaches that the particular dimensions the substrate surround ring are determined empirically to minimize slip and maintain substantially uniform temperature in substrate #2304 (col. 25, line 13-17).

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'686 does not explicitly teach the limitation of claims 7, 11, 15, and 19:

The substrate supporting surface is inclined at an angle of more than 0 degree and not more than 1 degree with respect to the horizontal surface.

'145 is an analogous art in semiconductor wafer substrate processing, including CVD. '145 teaches the substrate supporting surface can be 0.1-7 degrees ([0050, lines 4-7, ledge is substrate supporting surface). '145 is silent on the wafer size.

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have empirically explored various angle of substrate supporting surface for 300 mm substrates and '145 discloses that 0.1-7 degrees may be used. The motivation would have been from empirically to minimize slip and maintain substantially uniform temperature in substrate as taught by '686, with a reasonable expectation of success that one degree angle or below would have provided low slip and uniform temperature of substrate.

'686 and '145 together teaches all the limitations of claims 7, 11, 15, and 19, as discussed above.

'686 meets the limitations of claims 9, 13, 17, and 21:


The substrate supporting surface (Fig. 23D, #2391a) is capable of holding a substrate with curved ends, the tangent line of which would form identical angle as the substrate supporting surface (relative to the horizontal line). "The material or article worked upon does not limit apparatus claims" (MPEP 2115).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keath T. Chen whose telephone number is 571-270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

kc x.e.

  
MICHAEL B. CLEVELAND  
SUPERVISORY PATENT EXAMINER